2001

Emergence Characteristics of Several Annual Weeds

Robert G. Hartzler
Iowa State University, hartzler@iastate.edu

Douglas D. Buhler
Agricultural Research Service

Lowell Sandell
Iowa State University

Bernard J. Havlovic
Iowa State University, bhavlovi@iastate.edu

Carroll Olsen
Iowa State University

Emergence Characteristics of Several Annual Weeds

Abstract
No other event in the life cycle of weeds affects scouting and management timing as greatly as weed emergence. The timing and intensity of weed emergence affect everything from the effectiveness of burndown herbicides and preplant tillage, to timing of postplant tillage and herbicide application, to competitiveness of weeds that escape control, to seed production by surviving plants, to eventually population shifts. Given the importance of weed emergence to all forms of weed management, it seems logical that we should give greater attention to understanding and predicting weed emergence as affected by environmental factors, weed species, and management practices.

Disciplines
Agricultural Science | Agriculture

Emergence Characteristics of Several Annual Weeds

Bob Hartzler, professor,
Doug Buhler, USDA/ARS,
Lowell Sandell, research associate, agronomy,
Bernie Havlovic, superintendent, and
Carroll Olsen, extension area specialist

Introduction

No other event in the life cycle of weeds affects scouting and management timing as greatly as weed emergence. The timing and intensity of weed emergence affect everything from the effectiveness of burndown herbicides and preplant tillage, to timing of postplant tillage and herbicide application, to competitiveness of weeds that escape control, to seed production by surviving plants, to eventually population shifts. Given the importance of weed emergence to all forms of weed management, it seems logical that we should give greater attention to understanding and predicting weed emergence as affected by environmental factors, weed species, and management practices.

Materials and Methods

An area maintained in sod was tilled during the summer of 1997, and 12-inch diameter PVC pipes were buried vertically with one inch extending above the soil surface. Seeds from eleven weed species were collected in central Iowa during the 1997 growing season for use in these studies. In October, 1000 seeds of a single species were buried in the upper two inches of soil contained within a PVC pipe. Due to the large size of burs, only 50 cocklebur burs were buried within a pipe. Each treatment was replicated three times. During the 1998 and 1999 growing season the number of seedlings emerging within a pipe was determined weekly and then seedlings were removed by hand. A second experiment using seed collected during 1998 was established in the fall of 1998.

Results and Discussion

Giant ragweed was the first weed to emerge in 1998, with initial emergence observed on April 2 (Table 1). Velvetleaf initiated emergence one week after giant ragweed, and the next weeds to emerge were common sunflower and common lambsquarter. Tall morningglory and fall panicum did not initiate emergence until May 7, two months after giant ragweed.

Weeds vary in their emergence patterns, with some species having the majority of seedlings emerging shortly after the initial emergence, whereas others emerge over a long period of time. Woolly cupgrass and giant ragweed reached 90% of cumulative emergence in three weeks or less, whereas waterhemp, common lambsquarter, and tall morningglory required more than nine weeks to reach this level (Table 1). Waterhemp required seven weeks to reach 50% emergence, but then reached 90% emergence in an additional ten days.

The percentage of buried seed that emerged during the first year ranged from 3% for fall panicum to 44% for common sunflower (Table 1). Emergence percentages during the second year after burial decreased by more than 50% compared with the first year for all species except common lambsquarter and tall morningglory.

In the second experiment giant ragweed and common lambsquarter were the first weeds to emerge with seedlings present on April 5 (Table 2). Common cocklebur, fall panicum, tall morningglory and waterhemp initiated emergence approximately two months after the earliest emerging species.

Giant ragweed, woolly cupgrass and common cocklebur had the quickest emergence patterns, reaching 90% emergence in approximately four weeks or less (Table 2). Common lambsquarter,

fall panicum, tall morningglory and waterhemp required at least eight weeks to reach 90% emergence.

Only 2% of tall morningglory seed produced seedlings in 1999 compared with 89% for woolly cupgrass. Percent emergence decreased in the second year after burial for all species except common lambsquarter and tall morningglory.

Similar experiments have been conducted at four other locations across Iowa. This large database should help provide a better understanding of factors that influence weed emergence under a wide variety of conditions.

Acknowledgments

This research was funded by the Leopold Center for Sustainable Agriculture. We appreciate the efforts of the farm staff in gathering data during the experiments.

Table 1. Emergence characteristics of weed seeds buried in the upper two inches of soil in October 1997.

Species	Initial date of emergence (1998)	Days to reach % emergence (1998)		% emergence	
		50%	90%	1998	1999
Common cocklebur	April 30	21	52	39	5
Common lambsquarter	April 16	13	65	10	9
Common sunflower	April 11	9	31	44	7
Fall panicum	May 7	14	26	3	4
Giant foxtail	April 30	14	51	19	8
Giant ragweed	April 2	4	21	21	4
Tall morningglory	May 7	14	61	9	7
Waterhemp	April 23	47	57	12	5
Woolly cupgrass	April 23	5	15	27	2
Velvetleaf	April 9	17	31	39	12

Table 2. Emergence characteristics of weed seeds buried in the upper two inches of soil in October 1998.

Species	Initial date of emergence (1999)	Days to reach % emergence (1999)		% emergence	
		50%	90%	1999	2000
Common cocklebur	May 3	10	25	41	7
Common lambsquarter	April 5	17	71	8	13
Common sunflower	April 12	14	28	44	16
Fall panicum	May 3	28	63	21	16
Giant foxtail	April 26	17	40	27	4
Giant ragweed	April 5	1	30	52	18
Tall morningglory	May 3	62	80	2	10
Waterhemp	May 3	21	62	10	2
Woolly cupgrass	April 12	5	19	89	2
Velvetleaf	April 12	12	48	21	12